NDAG TASKING 2006-01
Issued March 6, 2006

Task Title: Assessment of Criticality Safety and Nuclear Data Needs Requiring a Super-SHEBA Capability

Task Statement: The NDAG is requested to identify essential and optional (i.e., essential capabilities/knowledge for safety/efficiency and optional areas that might be useful) needs in the broad areas of criticality safety support and nuclear data that can only be filled by a 'Super-SHEBA' capability. For each need (essential or optional) identified, a specific DOE program/project/facility that would benefit from the information must also be provided. Such capability will be restricted to pure uranyl nitrate solution experiments, including the ability to perform in burst mode (i.e., prompt critical experiments). It is envisioned that a new 'Super-SHEBA' facility will have the flexibility to tailor experimental vessel(s)/systems to match the needs of the specific experimental program much like the uranium solution experimental program at the Rocky Flats Critical Mass Laboratory.

Task Deliverable: A formal written report to the NCSP Manager.

Task Due: April 30, 2006

NDAG TASKING 2006-02
Issued March 6, 2006

Task Title: Assessment of Criticality Safety and Nuclear Data Needs Requiring Solution Critical Experiments Involving Other than Uranyl-Nitrate Solutions

Task Statement: The NDAG is requested to identify essential (for criticality safety) and optional (for cost efficiency) needs in the broad areas of criticality safety support and nuclear data that can only be filled by a facility capable of achieving solution criticality with other than pure Uranyl-Nitrate. For each need (essential or optional) identified, a specific DOE program/project/facility that would benefit from the information must also be provided. All international sources of the identified data needs should be identified including accessibility to existing data and the potential to acquire data in the future. The NDAG should identify the types of solutions and experimental capabilities required to address the gaps that remain once the global situation is considered. Considerations of siting and funding for such a capability is NOT within the scope of this tasking.

Task Deliverable: A formal written report to the NCSP Manager.

Task Due: June 30, 2006

Response to NDAG TASKINGs 2006-01 and 2006-02
June 30, 2006

Input to this response was initially discussed with and requested from 6 labs. That interaction failed to produce any specific positive recommendations or well supported arguments in support of these two facility types. Consensus remarks tended to be rather neutral or non-committal including:

- A very large set of U and Pu solution experiments already have been performed and many have been evaluated for the ICSBEP handbook.
- There also exists a significant set of proprietary data based on MOX solution experiments. Access to specific data of interest might be more cost effective than performing the same experiments.

It is however recognized that several generic arguments exist in support of building/maintaining solution critical experiment capability including:

- These facilities should be available to support safety analysis for processing facilities both DOE and commercial (Task 2006-01).
- It is important to maintain some critical experiment capability not only to support specific programmatic needs but also to support criticality safety training. Solution critical experiment capability could provide a valuable training block within the NCSP criticality safety training (Task 2006-01).
- A long-standing priority need for integral measurements has been for temperature coefficients for Pu solutions (Task 2006-02).
- It is likely that future processing of "next-generation" fuels or waste streams, e.g., related to GNEP, AFCI, GEN-IV, will require support of solution critical experiments (Task 2006-02).

<u>Recommendations</u>

If new U or Pu solution critical experiment capability is developed for the NCSP, it should be located at the Nevada site. This would strengthen and support the other integral experiment and training missions intended for this location.

It is recommended that the laboratories that would utilize and support this capability engage first in development of a program plan for solution experiments and second in a design effort for solution experiments. The planning should identify any existing "gaps" in the available solution critical experiments; should identify machine requirements and capabilities; and should identify material requirements. The planning of the capability might consider the alternatives of a "staged" implementation (e.g., initially develop minimal or prototype capability with sufficient flexibility to fully support training while

developing a follow-on machine with robust capabilities) versus a vigorous development of the “mother-of-all” solution critical experiment facility.

It is further recommended that NCSP management initiate and support the above “planning, then design” activities and base decisions (of facility type, capabilities, schedules of construction/operation, etc.) upon the product of those planning and design efforts.